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HYDROACOUSTICS INC ROCHESTER N Y  
CALIBRATION OF HLF-3 FOR 1978 SUMMER OPERATIONS. (U)  
JUN 78

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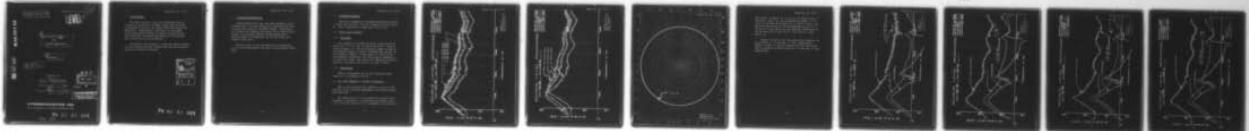
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6 CALIBRATION OF HLF-3  
FOR  
1978 SUMMER OPERATIONS

11 June 1978

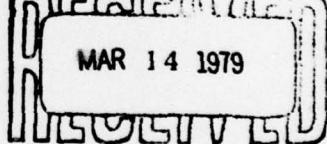
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Prepared for:

Code 222  
Office of Naval Research  
Arlington, Virginia 22217

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15 Contract No. N00014-78-C-0432 New



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1.0 INTRODUCTION

The HLF-3 acoustic source was refurbished and the calibration verified at the NUSC Seneca Lake facility, in preparation for the 1978 Summer Operations aboard the USNS Lynch. Refurbishment consisted of a redesigned Wetside Electronics package to improve reliability and serviceability, and design improvements to the pistons, motor mounts and suction strainers.

Calibration was required to verify the source performance and identify any gain changes that may have occurred during the electronic redesign.

ACCESSION No. *79-0124-067*

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2.0 CALIBRATION DESCRIPTION

During operations at sea, the disk (radiator) accelerometers and a tow body mounted F-37 hydrophone are used to measure the output of the HLF-3 source. Calibration was performed by comparing the output of the disk accelerometers, the tow body mounted F-37 hydrophone and a calibrated NUSC F-37 Hydrophone in the far field for a constant input level.

The end result of the calibration is a sensitivity for the disk accelerometers and the tow body mounted hydrophone.

### 3.0 CALIBRATION RESULTS

HLF-3 was calibrated at the NUSC Seneca Lake facility on April 24th and 25th, 1978, at a depth of 316 feet (96.3 m). Water temperature at depth was 37° F (3° C).

#### 3.1 SOURCE LEVEL RESPONSE

##### 3.1.1 Far Field

The response of the HLF-3 acoustic source for drive levels of 0, -3, -6, and -12 dB V (0 dB V re 1 V rms) is shown in Figure 3.1. The accelerometer signal is used in the feedback circuit to help to linearize and flatten out the response of HLF-3. In the event of a fault in the accelerometer electronics, the source may be operated in an "open loop" mode. The "open loop" response is shown in Figure 3.2 for drive levels of 0, -6, and -12 dB V.

##### 3.1.2 Directivity

HLF-3 is omnidirectional in the horizontal plane. Figure 3.3 is a pattern at 90 Hz.

#### 3.2 FAR FIELD PRESSURE -- MONITOR COMPARISONS

Each of the following four figures is a plot of the response of the far field hydrophone, tow body F-37 hydrophone and disk.

The sensitivity of the tow body F-37 and disk accelerometers is determined by subtracting the monitor value in dB V from the Source Level as measured in the far field.

Report No. HA 113-78

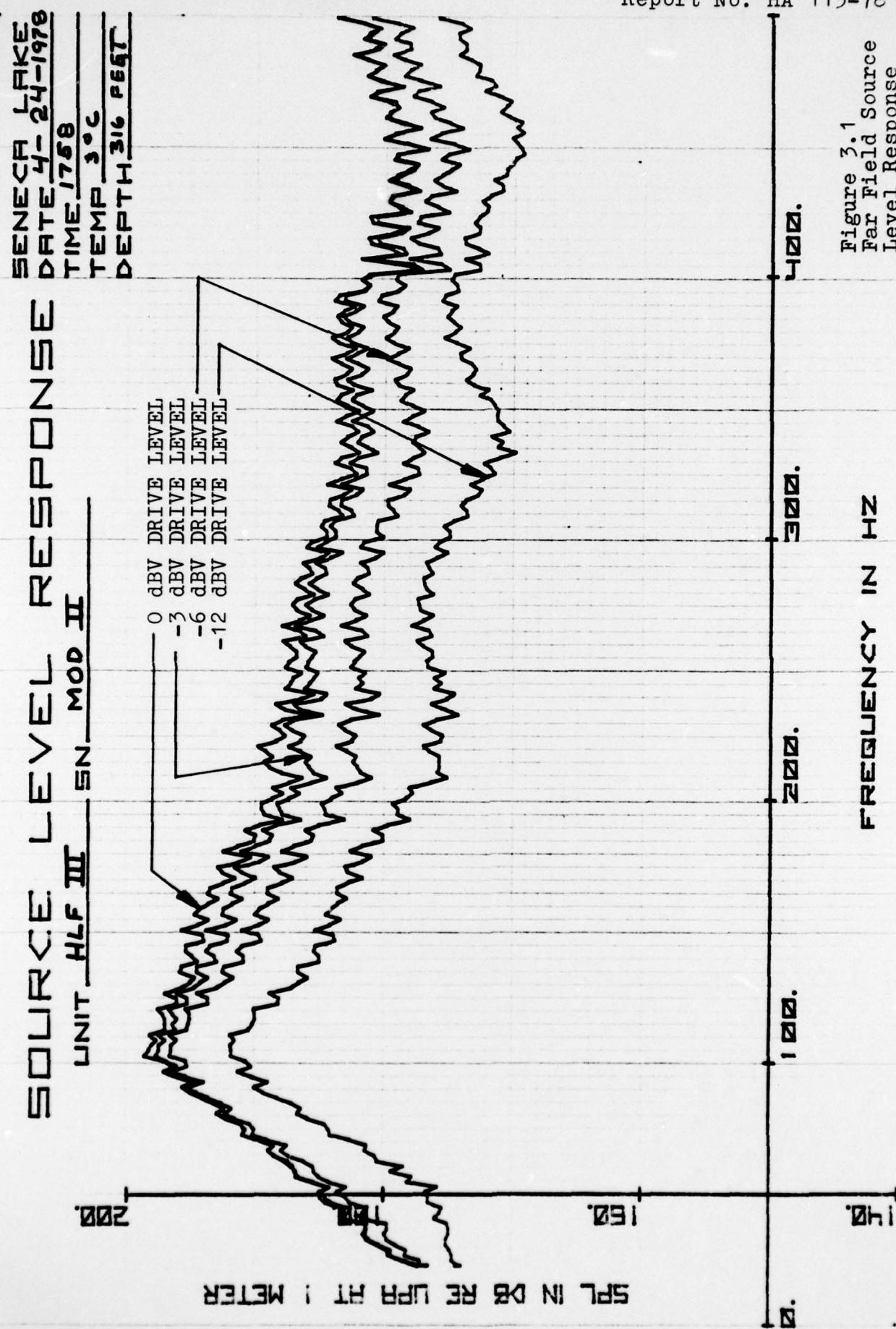


Figure 3.1 Far Field Source Level Response

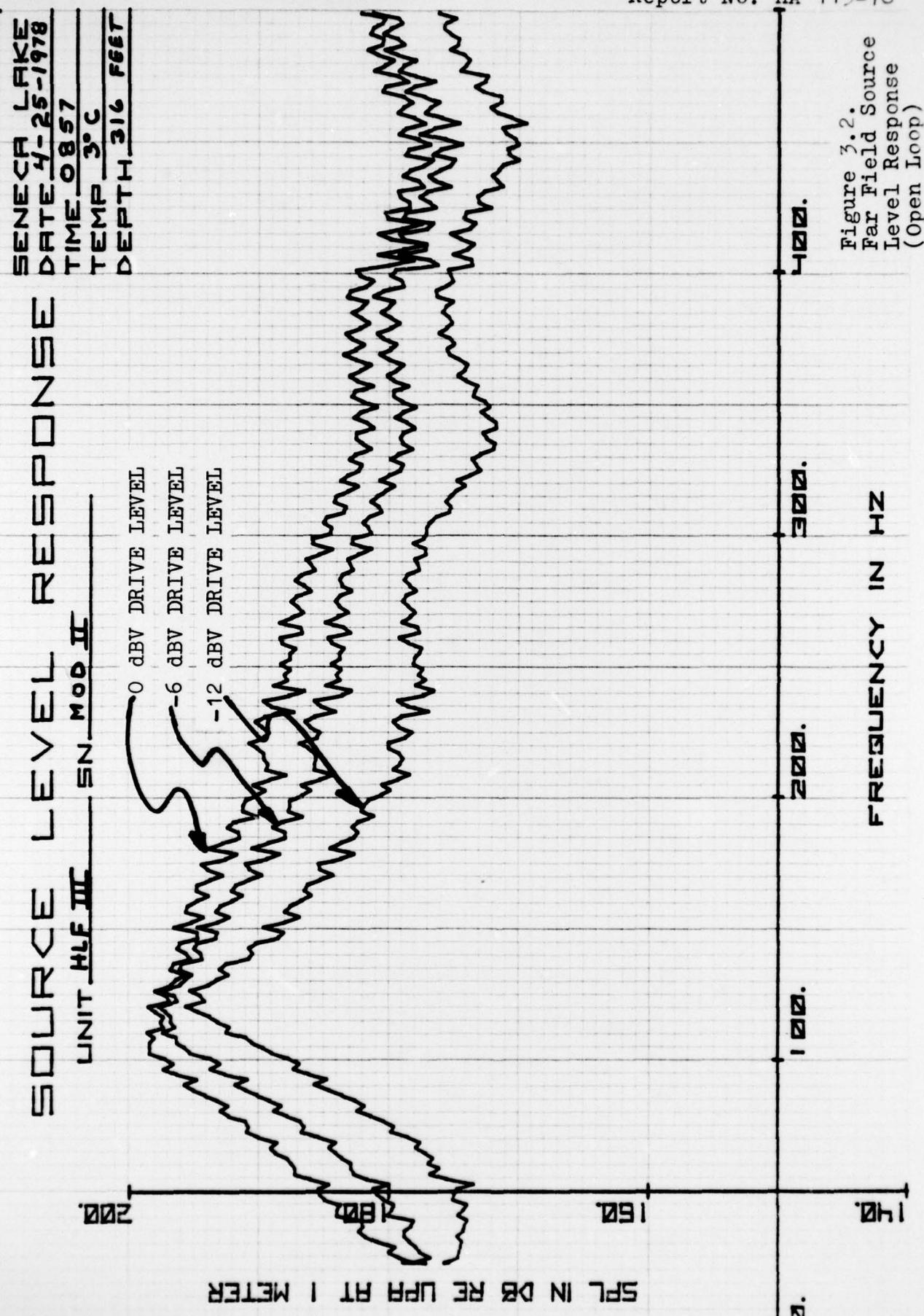
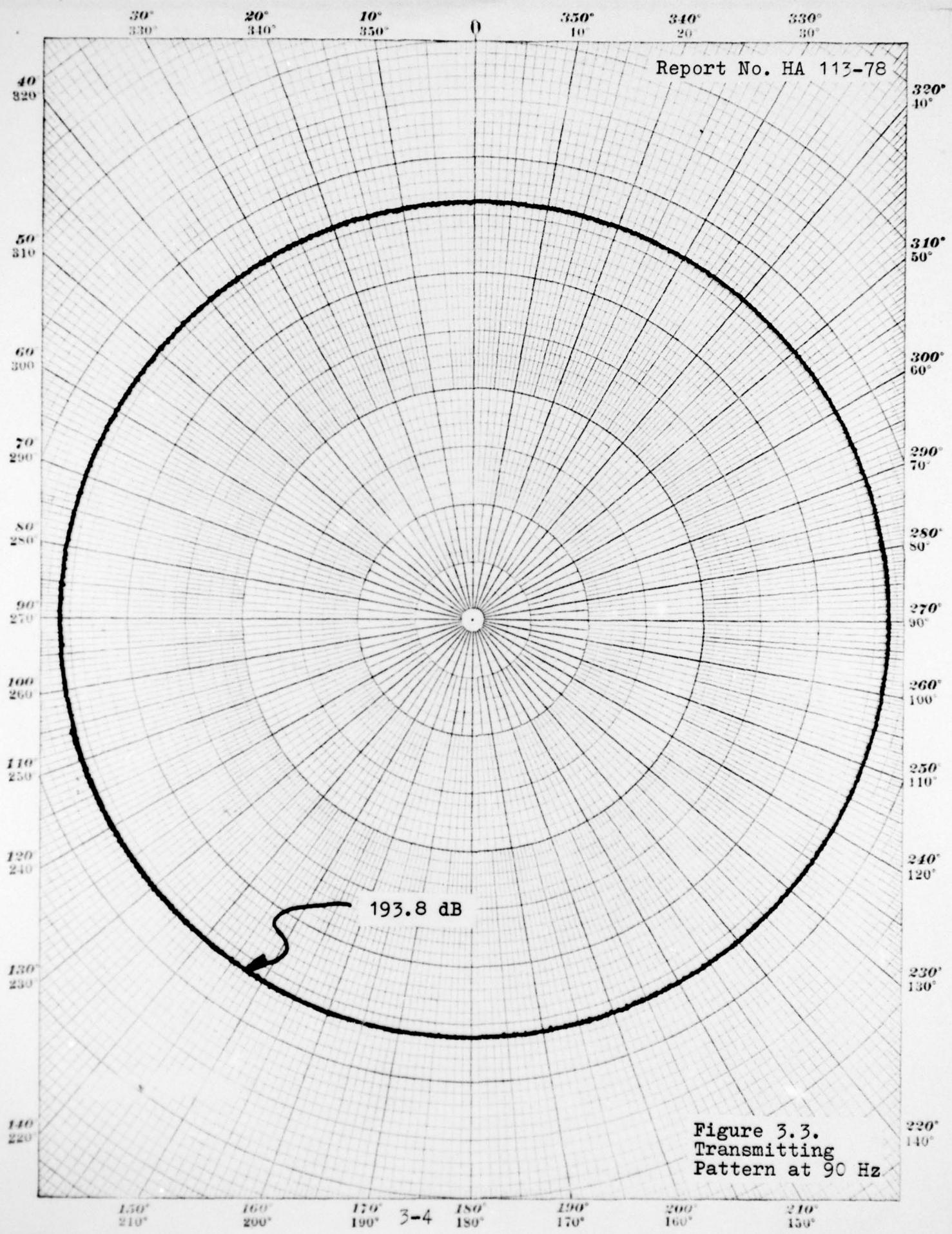


Figure 3.2.  
 Far Field Source  
 Level Response  
 (Open Loop)



For example, in Figure 3.4 at 100 Hz, the Source Level is 188 dB re 1 uPa @ 1 m, the Accelerometer signal is -1.0 dB V; the Tow Body F-37 signal is +2.5 dB at 100 Hz. The effective sensitivity of the Accelerometer is  $188 - (-1) = 189$  dB re 1 V per uPa @ 1 m; the effective sensitivity of the Tow Body F-37 is  $188 - (2.5) = 185.5$  dB re 1 V per uPa @ 1 m.

Figures 3.4 and 3.5 are the source level response for drive levels of .2 V rms and .4 V rms, respectively. Figures 3.6 and 3.7 are the response for the "open loop" mode of operation at drive levels of .2 V rms and .4 V rms, respectively.

SOURCE LEVEL RESPONSE  
UNIT HF-3 SN mod 7

SENECA LAKE  
DATE 4-25-78  
TIME 1130  
TEMP 30° C  
DEPTH 3/4 FEET

Report No. HA 113-78

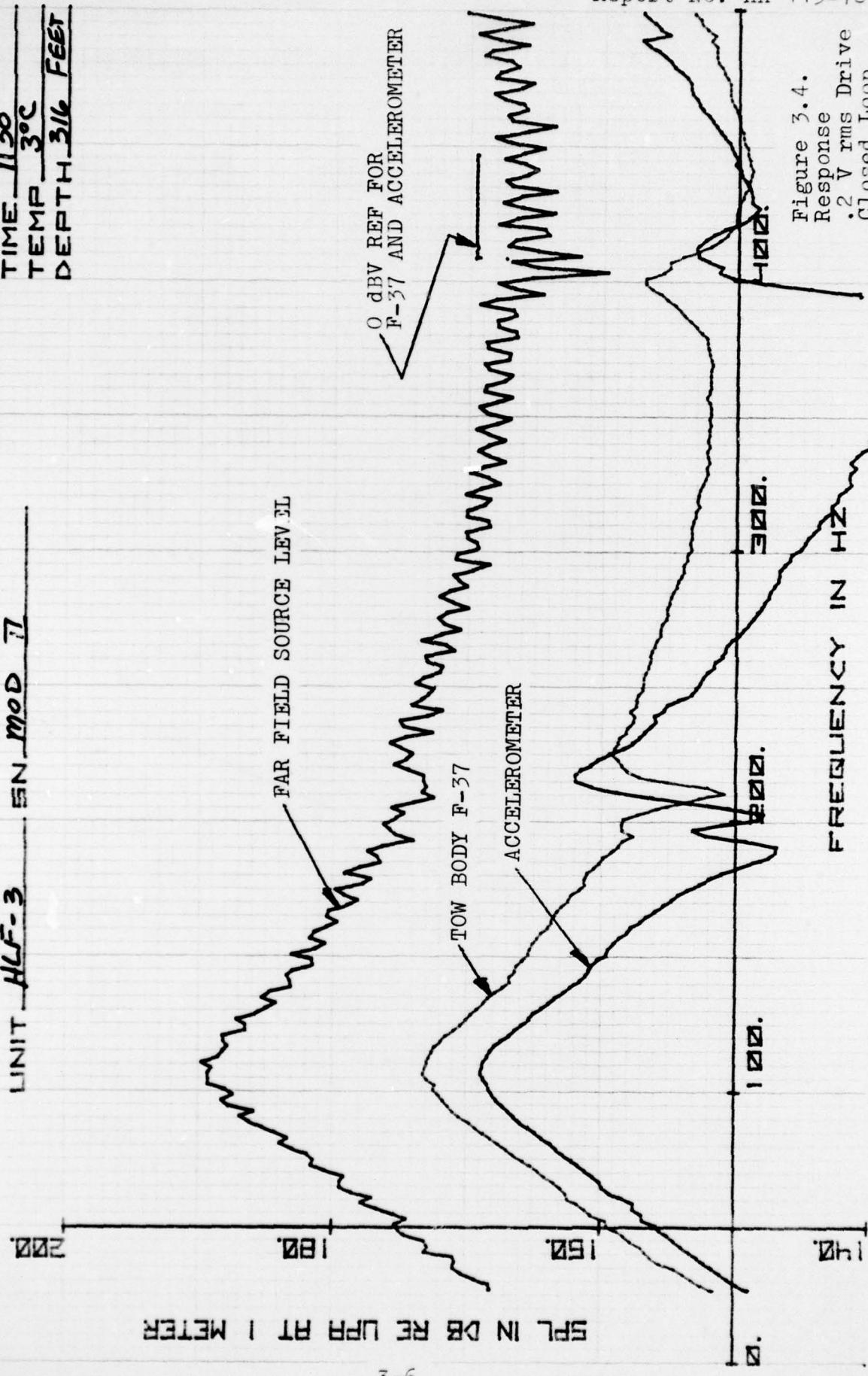


Figure 3.4.  
Response  
• 2 V rms Drive  
Closed Loop

SENCE CR-24-FIKE  
DATE 4-24-1978  
TIME 1740  
TEMP 30°C  
DEPTH 316 FEET

Report No. HA 113-78

SOURCE LEVEL RESPONSE  
UNIT HLF III SN 500 2

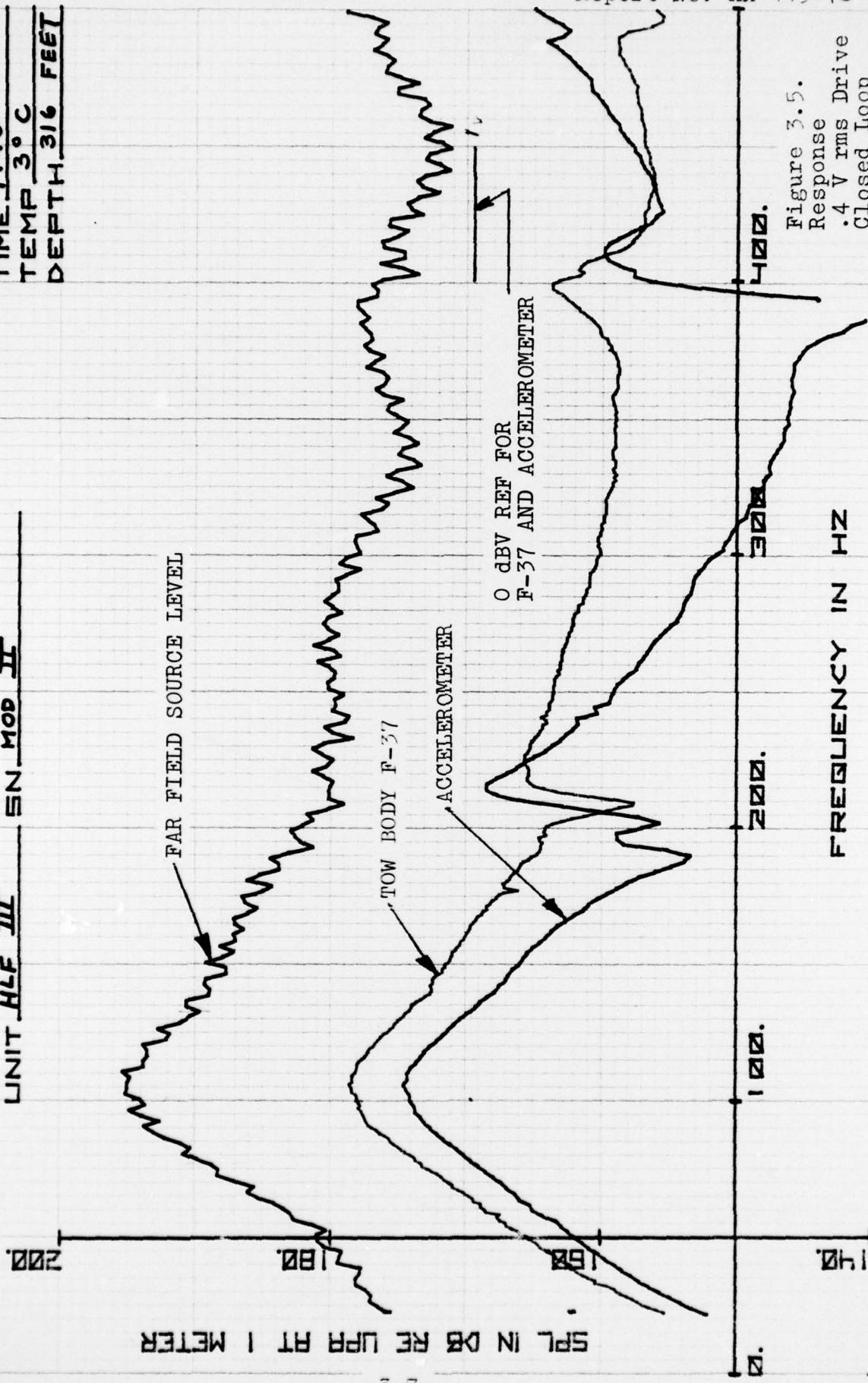
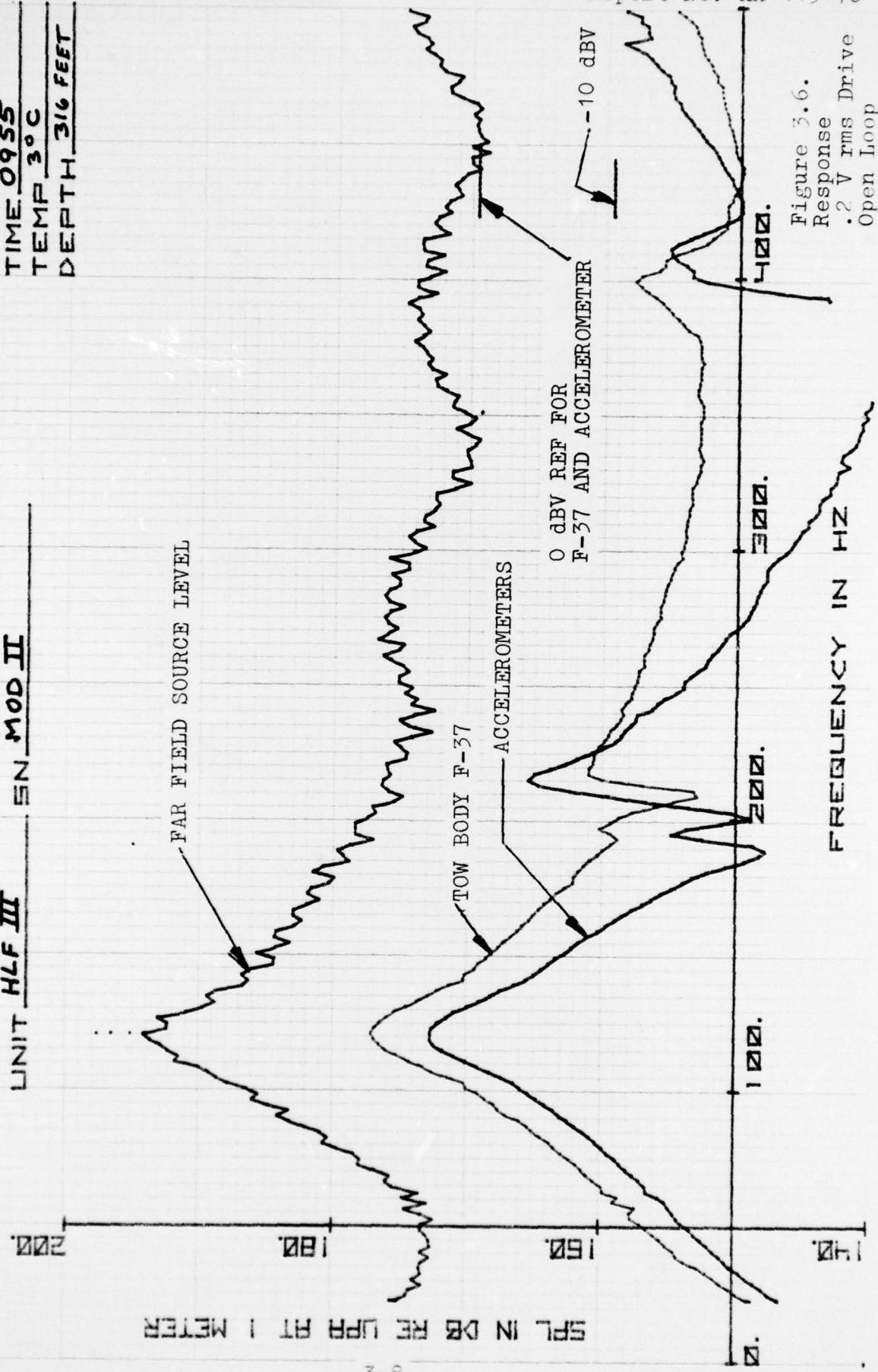


Figure 3.5.  
Response  
.4 V rms Drive  
Closed Loop

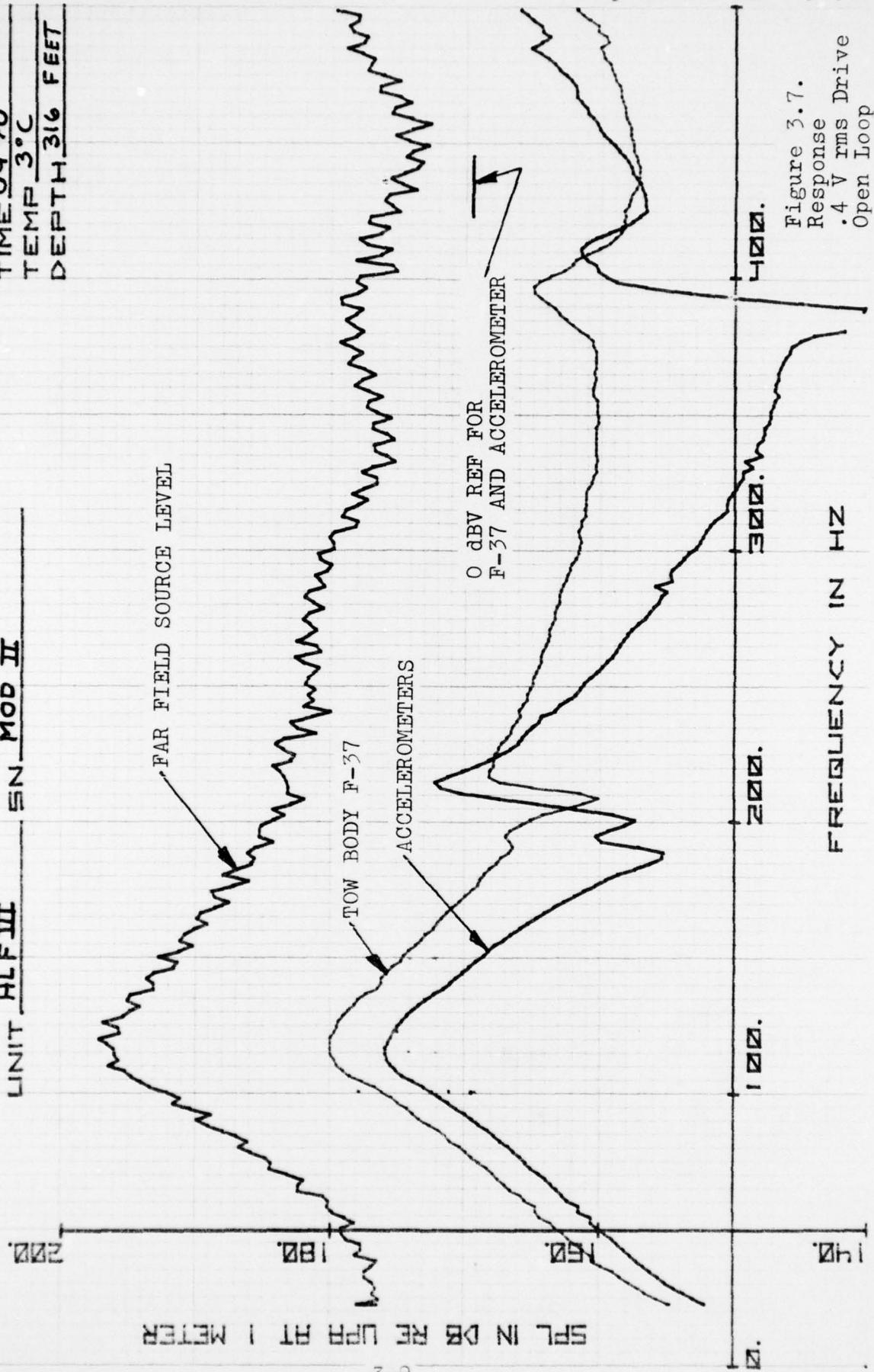
SENECAR L-14-1 DATE 4-25-1978  
TIME 0955 TEMP 3°C  
DEPTH 316 FEET

SOURCE LEVEL RESPONSE  
UNIT HLF III SN MOD II



SENeca LAKE  
DATE 4-25-1978  
TIME 0940  
TEMP 3°C  
DEPTH 316 FEET  
SOLID STATE LEVEL RESPONSE  
UNIT HLF III SN MOD II

Report No. HA 113-78



#### 4.0 SUMMARY

Using Figures 3.4 through 3.7, the tow body F-37 hydrophone sensitivity is  $-185.5 \pm .5$  dB re 1 V per uPa @ 1 m and the disk accelerometer sensitivity is  $-189.0 \pm .5$  dB re 1 V per uPa @ 1 m at the front panel. The theoretical sensitivity of tow body F-37 hydrophone is -186.2 dB re 1 V per uPa @ 1 m. More exact calibration values can be determined at each frequency of interest by subtracting the monitor reading in dB V from the Source Level.